EXPERIMENTAL STUDY OF EFFICIENT MIXING IN MICRO-FLUIDIZED BED

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The micro-fluidized bed represents a novel means of significantly enhancing mixing and mass and heat transfer under the low Reynolds number flows that dominate in microfluidic devices. This study experimentally evaluates the mixing performance in a micro-fluidized bed in terms of an efficiency index and the efficiency improvements it affords over the equivalent particle-free system. The dye dilution technique coupled with standard top-view image analysis was used to characterize the mixing efficiency in a 400 x 175 μm^2 polydimethylsiloxane (PDMS) Y-shaped microchannel. The micro-fluidized bed was found to afford mixing efficiencies up to 300% greater than those in the particle-free channel as shown in *Figure* 1. The mixing systems appear to have an optimal operating voidage of around 0.7, at which the efficiency of mixing is maximized.

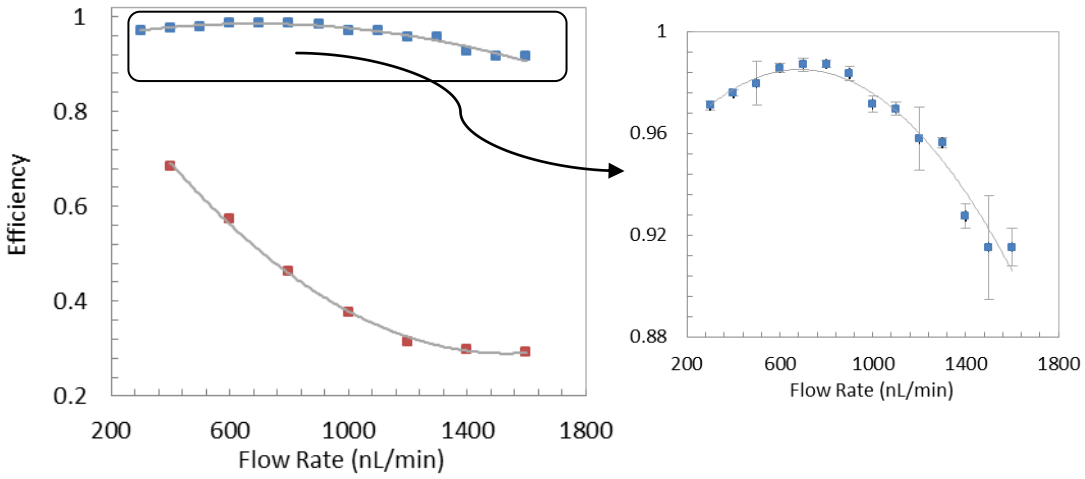

Figure 1. Mixing efficiency variation with inlet flow rates in the micro-fluidized bed of 30 μm glass particles (blue squares) and in the equivalent channel without particles (red squares).